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Defining Open Architecture For The Surface Fleet

By Geoff Fein

As the Navy begins to incorporate open architecture into the surface fleet, a number of challenges loom on the horizon from determining whether it is important to own source codes to determining exactly what constitutes open architecture.

For some, open architecture is the ability to seamlessly plug applications into systems via common interfaces. For others, true open architecture is only achieved when the source code is made available.

"It is really in the eye of the beholder many times," Anne Sandel, deputy assistant secretary of the Navy research, development and acquisition (ASN RDA), told Defense Daily in a recent interview.

The Navy began working with the legal community, contractual folks, people within the submarine community who have done this successfully with the Acoustic Rapid COTS (commercial off-the-shelf) Insertion (ARCI) program, to look at what exactly does open architecture mean to the service.

"How do we define that through contractual language that enables us to procure something that is open?" Sandel said.

The Navy has understood that it would love companies to provide them the source code, she added, but there is a business case that needs to be made for that.

"As you work through that business case, and that return on investment, you may decide that's going to be too costly," she said. "But if you can have that interface defined for you, that's satisfactory. That enables you to have that software interface and you are able to work

within that software functionality whatever that system might be. So it really depends on what you're procuring, what level of risk you are willing to bring into that procurement, and what level of cost is being done."

Program Executive Offices (PEO) have been working through the contractual language, examining what the Navy defines as government purpose data rights, Sandel said.

"If this is a functionality you know you will need across submarines, aviation, space, and surface, I would offer to you it would be in the government's best interest to have the code written in such a way you could [use] the application across those domains," she said.

But there is a business case assessment that Sandel believes must be mandated as the Navy goes forward in the open community. "You don't just open just to say I'm open."

"You may have a working system that is absolutely state-of-the-art affordable, low risk, and the program manager is loving it, but do you need to have that source code? There needs to be a business case for that," she said. "That is where you maintain that competitive advantage for that industry partner, so that he may not want to give you that nugget. Maybe that is his one area he makes the most profit off of. But you can work out a contractual arrangement that you are able to have an accessible boundary layer, then as a government buyer we should be satisfied with that."

The Navy is working through the contractual language, Sandel added. Each one of those contracts is a business case assessment with a return on investment to determine what level of

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openness the Navy would like, and that will likely be dictated by cost and schedule, she said.

One issue for the Navy has been the coupling of hardware and software, Sandel explained. "We have always been married to the hardware and software on the weapons side. Even if it was a display for the ship, the software that drove that was so integrally related to the hardware that when you upgraded the machine you had to upgrade the code, and that is so prohibitively costly."

Sandel acknowledges that the submarine force has led the way in recognizing the cost savings achieved by decoupling the hardware and software.

"The surface community has come to the table in the past five years and said we want to do that. There is a business case for it," she said.

Separating the hardware and software will help the Navy get systems to warfighters sooner, with improved capability, and more affordably, Sandel added. "There are a lot of components to that, that are appealing to the community if defined properly, and that's what Rear Adm. [Michael] Frick, [program executive officer for integrated weapons systems] spoke to the PEO IWS community [about]. They are leading that coordination of the community of interest through their open architecture enterprise team for ASN RDA," she said. The Navy is also looking at the issue of software reuse. The aviation community, for example, has been able to provide software over to the submarine warfare community, Sandel said.

"That is an amazing cost avoidance and it's a risk reduction area if you get to the change in culture and model because you now know you have a tried and true piece of software that has a specific functionality that's been tested and fielded, that you can now use and incorporate onto your platform," she said. "So it is a risk reducer as well as an affordable way to approach this business model."

Besides the cost savings achieved from separating hardware and software, the Navy came to the conclusion that there is a payoff in both the competitive edge and ability to bring in small businesses that come along with the open architecture approach. The surface fleet saw that in the lessons learned from the submarine side--that small businesses will become interested and available to participate. "You just widened your

playing field and what that drove us to, which is very interesting, we had to become much more educated than we were as we learned we wanted to embrace small business," Sandel said.

"We wanted the ability to be open and have rapid turnaround of capability. But that required some foundational work on our part. To do the separation of hardware and software, you actually had to go and make incremental changes to the components you were procuring," she added.

One example was the necessity to break down lines of code, million and millions of lines of code, Sandel said. "What are those functions that comprise that code?"

Those lines of code can be broken down into manageable chunks, which is the architecture part that can be competed, Sandel added.

"You may decide for some reasons that you want to compete four aspects of that functionality, or you may want to compete all of that," Sandel said. "Even so, you bring in a wider playing field of people who have algorithms to bring to you [systems] in a more cost effective manner and in definitely a much quicker manner."

Industry embraced open architecture and worked aggressively with the Navy to lead the effort.

Initially the Navy began this process and they worked with the warfare centers and the government side of the business to help service personnel to become better educated in open architecture, Sandel said. "We went through a series of developing government standards with government subject matter experts. We then realized that that presented difficulties of its own because it's almost the old military standards--when you imposed a military standard specification in a contract, many times the government has incurred the risk as well as some additional cost if it wasn't well thought out."

"We realized at that point that we needed to bring in the larger companies that worked a lot of these issues for us in the past," she added. "You tend to want to go do it yourself. We learned quickly you could not do that."

Another potential issue for the Navy was whether to go back and begin applying open architecture standards to legacy platforms, or

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look forward to new systems coming down the road.

"Initially our strategy was to look at the future developments, what are the forward coming contracts, what are we going to go out and procure in 2007, '08, '09 and then we will go and put the right contractual language and terminology in and be open," Sandel said. "We then realized we were neglecting the whole remaining legacy fleet as well as the aviation community. There were a lot of assets out there in service, operationally, that could benefit from this because they needed to increase functionality. You didn't have the ability to give the warfighter the capability to do his job because you were limited by the processing power or the code that was on that particular processor, or that particular piece of equipment."

So the Navy quickly realized if it was going to benefit anyone it needed to benefit the warfighter and the operational community today and figure out a way to do that affordably, Sandel said. "That changed our strategy and our approach."

Now not only did the Navy work to make sure all future contracts were properly worded and addressed, but the services looked at existing systems and platforms to see who could benefit from open architecture in a way that was affordable and low risk, Sandel added.

That model was applied to the DDG modernization effort, she added.

"That was an opportunity window for us to say we are going to have the DDGs come in, on proscribed time for modernization. We already want to have the ability to have the upgraded processors in there. This is the perfect time to bring in additional capabilities and a software functionality," she said. "If I [had] the program manager [sitting next to me] you would see an incremental upgrade of capability in an open architecture environment though the DDG modernization program. The same thing occurred in the aviation community."

The aviation community recognized that they had platforms coming in on a regular basis, so they began to look at how they do increased processing power and the sharing of software, Sandel added.

The Navy looked at the ARCI model and realized bringing in an Aegis destroyer every 18 months might create problems for ship availability, Sandel said. "What we worked through was the rapid capability improvement program (RCIP), as opposed to ARCI. So this process defined the 24 month to 48 month periodicity where we were able to incorporate upgraded hardware and software as an availability comes to bear."

"So FY '09 is when you will see the formal process kick in for RCIP. What you have watched in the submarines now for 10 years, we are going to finally have adopted and institutionalized for the surface side," Sandel said.